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Case report: Endoscopic endonasal removal of large osteoma in the ethmoid sinus

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Abstract. *Case report: Endoscopic endonasal removal of large osteoma in the ethmoid sinus. Problem*: A 25-year-old man presented with a large osteoma in the right ethmoidal sinus.
Methodology: The osteoma was removed by an endoscopic endonasal approach with a curved diamond drill and an electromagnetic navigation system.
Result: Computed tomography 3 days after surgery showed complete removal of the osteoma and normal position of the right eyeball. No long-term follow-up results were available.
Conclusions: This clinical case highlights the use of the endoscopic endonasal approach for the safe and reliable treatment of sinus osteomas, particularly large osteomas. We also describe various manifestations of osteoma, its diagnosis, and surgical management.

Introduction

Osteomas are mature benign osteogenic tumors characterized by slow growth. Sinus osteomas may arise from any sinus wall; e.g., from a wide basis or a thin peduncle. They are located most frequently in the ethmoid sinuses (55%), followed by frontal (37.5%), maxillary (6%), and sphenoid sinuses (1.5%), according to Erdogan *et al*.[1] Although these lesions are classified as benign tumors, they can cause aggravating, sometimes irreversible, symptoms and complications, such as impaired vision and meningitis, if they exert pressure on or destructively grow into the surrounding structures.

Case report

In January 2014, a 25-year-old male patient was transferred to the ENT department of Pavlov First Saint Petersburg State Medical University with swelling of the right lower eyelid and frequent nose blowing. Swelling of the right periorbital soft tissues (emphysema) had occurred periodically since December 2013. X-ray examination of the paranasal sinuses had been performed previously in a regional hospital and revealed a pathologically dense formation in the right ethmoidal sinus. Patient-related history showed moderate nasal congestion, reduced smell in the right half of the nasal cavity, and headaches in the right forehead for 10 years.

The patient was transferred to our hospital for further assistance and treatment. Examination of the nose and nasopharynx with different rigid endoscopes (0°, 30°, and 45°) showed pink moderate swelling of the nasal mucosa on the right site. The nasal septum was moderately deviated to the left. The right-sided uncinate process was deviated anteriorly due to polyposis.

Computed tomography (CT) of the paranasal sinuses revealed a large osteoma (Figure 1). The osteoma was 2.8 × 3.5 × 4.2 cm, and it was embedded in soft tissue in the right ethmoidal sinus with a sharp edge and complicated by penetration of the medial orbit. Soft tissue opacification in the left ethmoidal sinus and the right maxillary sinus was also present. Urgent surgery was indicated because of soft tissue invasion of the orbit, recurring periorbital emphysema, and the threat of orbital complications. The patient had been informed in advance that in case of failure of the endoscopic endonasal surgery, the osteoma would be removed by external access.

In February 2014, the tumor was removed under general anesthesia with controlled hypotension under endoscopic control and using our electromagnetic 3D-navigation system. After the uncinate process resection, the anterior ethmoidal sinus cells

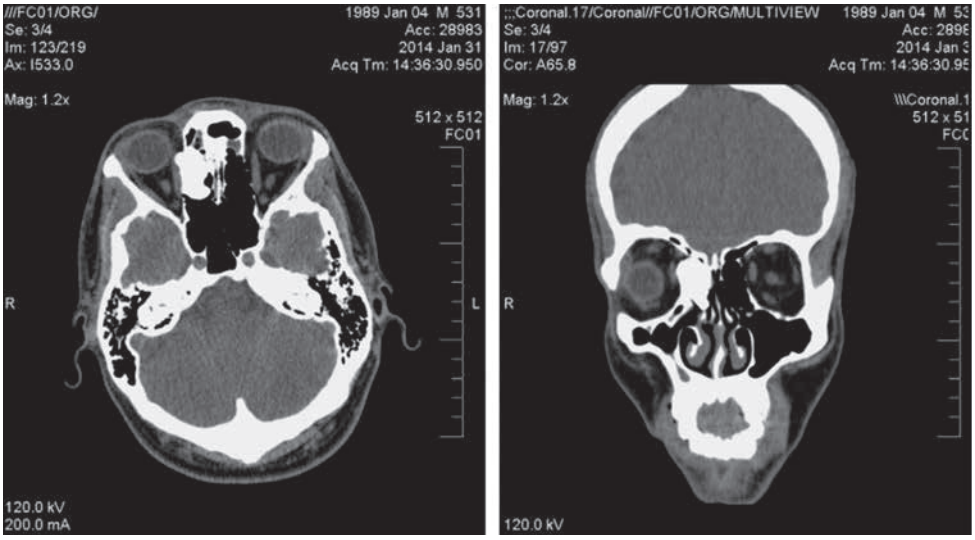

Figure 1
Preoperative CT scan, axial (left) and coronal (right), revealed a large osteoma in the right ethmoid sinus, with penetration of the medial orbit wall.

were exposed. The surface of the osteoma-like tumor came into view. The volume of the osteoma was reduced in the medial part by a straight and a curved diamond drill (Figure 2). After careful separation from the intraorbital tissues, the large osteoma was removed through the nasal cavity. The specimen after reduction was 2.2×3.2×4.2 cm (Figure 3). A defect of 0.7×0.6×0.9 cm in the papyracian wall of the orbit was detected after the intervention. At the end of the surgery, hemostatic packing was inserted in the right nostril. Blood loss at the end of the surgery was 150 ml. Time of the surgical procedure was 90 minutes. Morphological examination confirmed a large osteoma. A right periorbital hematoma was visible during the early postoperative period. The patient was examined by our ophthalmologist; no orbital decompression was recommended. The patient was treated with systemic antibiotics, glucocorticoids, and diuretics. The periorbital hematoma disappeared within 5 days. Hemostatic packing was removed 1 day after surgery. A CT scan 3 days after surgery showed complete removal of the large osteoma and normal position of the right eyeball (Figure 4). The patient was discharged on the 7 days after surgery. Regular follow-up at the ENT and ophthalmology department was performed. Unfortunately, we do not have the long-term results of CT studies because the patient lived in a region distant from Saint Petersburg.

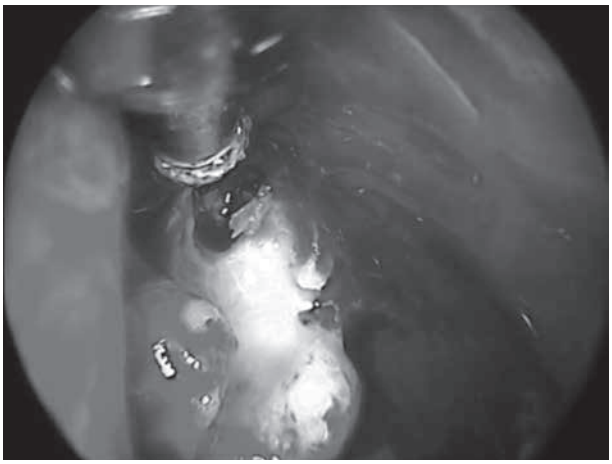

Figure 2
Perioperative picture. Removal of the osteoma using curved diamond drill.

Discussion

Osteomas can be subdivided by histological structure into three types. Compact (“ivory”) osteoma consists of dense bone that contains a minimal amount of fibrous tissue and no haversian canals. Spongeous (“mature”) osteoma comprises mature bone, in which trabeculae are divided by a significant amount of fibrous tissue that contains fibroblasts in various stages of development and a large amount of collagen fibers. Mixed osteoma

Figure 3
Removed reduced osteoma, measuring 2.2×3.2×4.2 cm

includes structures of both compact and spongeous tissue.[2] Bone marrow ("medullary") osteomas are also described in the literature.[3-8]

Osteomas may be found as single or multiple tumors. Single osteomas are most often observed. Multiple osteomas can occur in genetic diseases as an autosomal dominant type; i.e., in Gardner syndrome, which is also associated with colonic polyposis and a variety of soft tissue tumors (e.g., subcutaneous fibromas, atheromas, and dermoid cysts).[3]

The multiple type of osteoma is uncommon in the general ENT practice. There is no consensus on the cause and etiology of the occurrence of osteomas, but there are several theories. According to the traumatic theory, the development of bone tumors is associated with a trauma. The infectious theory claims that the initial mechanism of bone formation is associated with local inflammation in the paranasal sinuses. The embryogenic theory postulates that an osteoma develops at the junction between the embryonic cartilage of the ethmoidal bone and the brim of the frontal bone. This explains the presence of osteoma in the frontoethmoidal region, but does not explain why the tumors grow in other regions.[4] In our patient, there was no history of head injury or infection, nor of a genetic disease.

Osteomas often have no specific clinical picture and can be asymptomatic. Small osteomas in narrow drainage areas can lead to symptoms of chronic sinusitis, sometimes with polyposis. Large osteomas located close to the natural ostiae mainly lead to pain. Both large and giant osteomas can cause symptoms by growing into adjacent structures or by causing compression. Osteomas are called giant when their weight reaches ≥110 g and their size is >30 mm.[9] Mucoceles can also develop. Pneumoencephalon, meningitis, brain abscess, orbital or face deformation, limitation of eye bulb

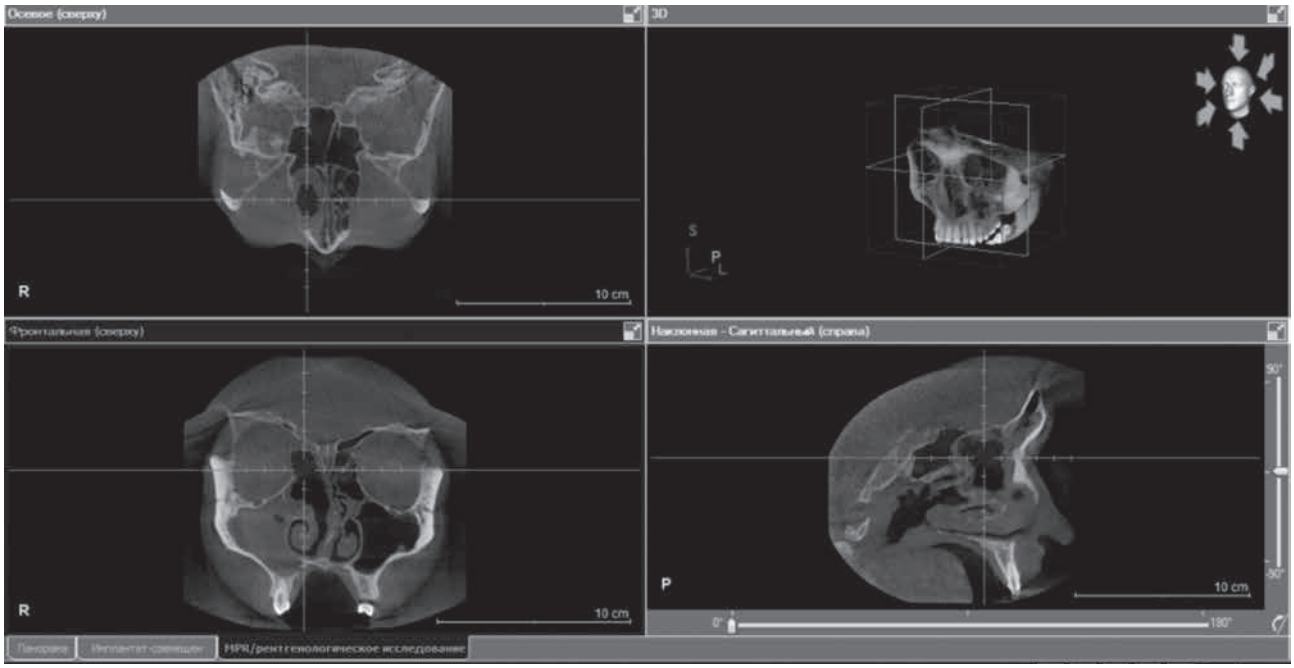

Figure 4
CT 3 days after surgical treatment showed complete removal of the right ethmoid osteoma

mobility, impaired vision, and seizures are possible complications of the destructive growth of these bone tumors.[5]

In our patient, the presenting signs and symptoms alone did not reveal the diagnosis of sinus osteoma. Diagnostic work-up with imaging was needed. Plain x-ray is excellent for revealing osteomas, although CT is presently the diagnostic method of choice, since it can concurrently evaluate the surrounding structures. Osteoma is a radio-opaque, dense, bone-like structure with well-defined margins and without contrast enhancement.[5,6] The differential diagnosis includes other lesions originating from bone, such as fibrous dysplasia and ossifying fibroma, although these lesions have less well-defined margins. CT is indicated for primary diagnosis, preoperative assessment, and postoperative follow-up. 3D tomography can be used for image-guidance surgery.

We assumed that our patient's periorbital emphysema was related to the invasive growing pattern of the osteoma through the medial wall of the orbit. Therefore, surgical intervention was necessary. Expansive osteomas should be removed in a timely manner, entirely and with the least traumatic and cosmetic consequences for the patient. Treatment should be carried out surgically via an external approach, endoscopic endonasal access, or a combined approach.[2,5,7,8] All of these approaches have their indications and limitations. Surgery consists of the following steps: tumor volume reduction, tumor mobilization from surrounding tissues, and subsequent removal from the nasal cavity and paranasal sinuses. Currently, the most commonly used approach is external access through the sinus containing the osteoma. In order to eliminate facial skin defects, a coronary incision via a forehead flap yields the best cosmetic results.

In our case, the surgeon used an endoscopic endonasal approach with an electromagnetic 3D-navigation system and curved diamond drill. The use of a drill with a diamond tip allows the tumor to be reduced step by step in thin layers, which is safest for the surrounding structures. Although our patient's osteoma was safely removed, one surgical minor complication occurred postoperatively: an orbital hematoma. The remainder of the postoperative course was uneventful. CT 3 days postoperation demonstrated complete removal of the tumor.

With the increasing use of functional endoscopic sinus surgery, endonasal access during surgery to remove osteomas has become more widely available. The advantages are the minimal surgical trauma and the absence of aesthetic facial blemishes. Previously reports have stated that osteomas can be treated successfully by the endoscopic approach without any recurrence or complications despite the often large size of the tumor.[4,7,10]

In difficult cases, a combined approach is preferred for better exposition. The main disadvantage of any external access close to the sinus is aesthetically unsatisfying sinus wall defects. There are several well-known approaches and materials for solving the aforementioned problems from an aesthetic perspective, including demineralized bone transplants, metallic implants, and fascial transplants, with more or less good results. The obvious question is when to use an external access versus an endoscopic endonasal approach; this depends on tumor size, location of attachment, general condition of the patient, the ENT clinic's equipment, and – perhaps most important – the rhinosurgeon's experience. The surgeon who carries out the intervention must be familiar with all of the techniques and certainly with the endoscopic approach, when he wants to use it. It is not a risk-free intervention, and the endoscopic endonasal removal of an osteoma is among the most complex procedures of sinus surgery. It requires good preoperative planning, patience and care during the operation, and excellent surgical skills. Use of special equipment, such as curved drills for power-driven systems, a diode laser, an endoscopic stand, and 3D-navigation image guidance increases the probability of successful endoscopic removal and extends the indications for endoscopic surgery for sinus osteomas, especially in the frontal sinus region.[1]

Conclusion

Sinus osteomas have a wide and varied clinical spectrum, depending on the location and degree of invasion into the surrounding structures. In our patient, who had a large osteoma in the ethmoidal sinus, the only symptom was the emergence of recurrent periorbital emphysema. CT is mandatory for diagnostic work-up. Surgical removal of sinus osteomas can be performed by an external approach, although this technique has aesthetic disadvantages.

In our case, successful endoscopic endonasal removal of the tumor was performed by a rhinosurgeon, supported by advanced medical equipment, without surgical complications. Based on our case and previous reports in the literature, the endoscopic endonasal approach is a reliable and safe method for complete removal of large ethmoid osteomas.

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